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MACTEC ENVIRONMENTAL RESTORATION SERVICES, LLC

Spectral Gamma-Ray Borehole
Log Data Report

Log Event A

Borehole # 21-02-06

Borehole Information

Farm : BX	**Tank :** BX-102	**Site Number :** 299-E33-143
N-Coord : 45,450	**W-Coord :** 53,240	**TOC Elevation :** 656.08
Water Level, ft :	**Date Drilled :** 7/31/1970	

Casing Record

Type : Steel-welded	Thickness, in. : 0.280	ID, in. : 6
Top Depth, ft. : 0	Bottom Depth, ft. : 100	

Borehole Notes:

According to the driller's log, this borehole was drilled in July 1970 to a depth of 100 ft using 6-in. casing. A starter casing of unknown dimensions was installed to a depth of about 12 ft; it is unknown whether the starter casing was removed. The drilling report does not indicate the borehole casing was perforated or grouted. The casing thickness is presumed to be 0.280 in., on the basis of the published thickness for schedule-40, 6-in. steel tubing. The top of the casing, which is the zero reference for the SGLS, is approximately 0.5 ft below the ground surface.

Equipment Information

Logging System : 2	**Detector Type :** HPGe	**Detector Efficiency:** 35.0 %
Calibration Date : 04/1997	**Calibration Reference :** GJO-HAN-13	**Logging Procedure :** P-GJPO-1783

Log Run Information

Log Run Number :	1	**Log Run Date :**	05/14/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	0.0	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	20.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	2	**Log Run Date :**	05/15/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	99.5	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	66.0	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Log Run Number :	3	**Log Run Date :**	05/15/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	19.5	**Counting Time, sec.:**	100	**L/R :** L **Shield :**	N
Finish Depth, ft. :	54.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

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Log Run Number :	4	**Log Run Date :**	05/16/1997	**Logging Engineer:**	Bob Spatz
Start Depth, ft.:	67.0	**Counting Time, sec.:**	100	**L/R :** L	**Shield :** N
Finish Depth, ft. :	53.5	**MSA Interval, ft. :**	0.5	**Log Speed, ft/min.:**	n/a

Analysis Information

Analyst : S.D. Barry

Data Processing Reference : MAC-VZCP 1.7.9 Analysis Date : 07/08/1997

Analysis Notes :

This borehole was logged by the SGLS in four log runs. The pre- and post-survey field verification spectra met the acceptance criteria established for the peak shape and detector efficiency, confirming that the SGLS was operating within specifications. The energy calibration and peak-shape calibration from these spectra were used to establish the channel-to-energy parameters used in processing the spectra acquired during the logging operation.

Casing correction factors for a 0.280-in.-thick steel casing were applied during analysis.

The man-made radionuclides Cs-137, Co-60, and processed uranium were detected around this borehole. The presence of Cs-137 was measured continuously from the ground surface to a depth of 5.5 ft. Alternating zones of intermittent and continuous Cs-137 contamination were detected from 6 ft to the bottom of the logged interval (99.5 ft). The presence of Co-60 was detected from 39 to 44 ft. The processed uranium was detected from 42 to 43 ft.

The K-40 concentrations increase at about 40 ft. It was not possible to identify many of the 609-keV peaks used to derive the U-238 concentrations between 40 and 43 ft. This occurred because high gamma-ray activity associated with the nearby Co-60 peak (1173 keV) and processed uranium peaks (185.99 keV and 1001 keV) created an elevated Compton continuum extending to the 609-keV region, causing the MDL to exceed the measured natural U-238 concentration.

An analysis of the shape factors associated with applicable segments of the spectra was performed. The shape factors provide insights into the distribution of the Cs-137 and Co-60 contamination and into the nature of zones of elevated total count gamma-ray activity not attributable to gamma-emitting radionuclides.

Additional information and interpretations of log data are included in the main body of the Tank Summary Data Reports for tanks BX-101 and BX-102.

Log Plot Notes:

Separate log plots show the man-made and the naturally occurring radionuclides. The natural radionuclides can be used for lithology interpretations. The headings of the plots identify the specific gamma rays used to calculate the concentrations.

Uncertainty bars on the plots show the statistical uncertainties for the measurements as 95-percent confidence intervals. Open circles on the plots give the MDL. The MDL of a radionuclide represents the lowest concentration at which positive identification of a gamma-ray peak is statistically defensible.

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A combination plot includes the man-made and natural radionuclides, the total gamma derived from the spectral data, and the Tank Farms gross gamma log. The gross gamma plot displays the latest available digital data. No attempt has been made to adjust the depths of the gross gamma logs to coincide with the SGLS data.

A time-sequence plot of the historical gross gamma log data from 1975 to 1992 is included with the SGLS plots.

Plots of the spectrum shape factors are also included. The plots are used as an interpretive tool to help determine the radial distribution of man-made contaminants around the borehole.